Complete Summary

GUIDELINE TITLE

ACR Appropriateness Criteria™ for blunt abdominal or pelvic trauma--suspected vascular injury.

BIBLIOGRAPHIC SOURCE(S)

Pagan-Marin H, Bettmann MA, Boxt LM, Gomes AS, Grollman J, Henkin RE, Higgins CB, Kelley MJ, Needleman L, Polak JF, Stanford W, Hessel SJ. Blunt abdominal or pelvic trauma--suspected vascular injury. American College of Radiology. ACR Appropriateness Criteria. Radiology 2000 Jun;215(Suppl):41-7. [67 references]

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Blunt abdominal or pelvic trauma, suspected vascular injury

GUIDELINE CATEGORY

Diagnosis

CLINICAL SPECIALTY

Cardiology
Emergency Medicine
Radiology
Surgery

INTENDED USERS

Health Plans
Hospitals
Managed Care Organizations
Physicians
Utilization Management

GUIDELINE OBJECTIVE(S)

To evaluate the appropriateness of initial radiologic examinations for blunt abdominal or pelvic trauma, suspected vascular injury

TARGET POPULATION

Patients with blunt abdominal or pelvic trauma, suspected vascular injury

INTERVENTIONS AND PRACTICES CONSIDERED

1. Abdominal/pelvic plain radiographs
2. Computed tomography with contrast
3. Aortography
4. Selective visceral angiography
5. Abdominal ultrasound
6. Computed tomography without contrast
7. Intravenous pyelogram
8. Magnetic resonance imaging
9. Radionuclide renal scan
10. Abdominal Doppler ultrasound
11. Aortoiliac ultrasound
12. Aortoiliac Doppler ultrasound
13. Intravascular ultrasound

MAJOR OUTCOMES CONSIDERED

Utility of radiologic examinations in differential diagnosis

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The guideline developer performed literature searches of recent peer-reviewed medical journals, primarily using the National Library of Medicine's MEDLINE database. The developer identified and collected the major applicable articles

NUMBER OF SOURCE DOCUMENTS

The total number of source documents identified as the result of the literature search is not known.

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Expert Consensus (Delphi Method)
Weighting According to a Rating Scheme (Scheme Not Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

One or two topic leaders within a panel assume the responsibility of developing an evidence table for each clinical condition, based on analysis of the current literature. These tables serve as a basis for developing a narrative specific to each clinical condition.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Delphi)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Since data available from existing scientific studies are usually insufficient for meta-analysis, broad-based consensus techniques are needed to reach agreement in the formulation of the Appropriateness Criteria. Serial surveys are conducted by distributing questionnaires to consolidate expert opinions within each panel. These questionnaires are distributed to the participants along with the evidence table and narrative as developed by the topic leader(s). Questionnaires are completed by the participants in their own professional setting without influence of the other members. Voting is conducted using a scoring system from 1-9, indicating the least to the most appropriate imaging examination or therapeutic procedure. The survey results are collected, tabulated in anonymous fashion, and redistributed after each round. A maximum of three rounds is conducted and opinions are unified to the highest degree possible. Eighty (80) percent agreement is considered a consensus. If consensus cannot be reached by this method, the panel is convened and group consensus techniques are utilized. The strengths and weaknesses of each test or procedure are discussed and consensus reached whenever possible.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria and the Chair of the ACR Board of Chancellors.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

ACR Appropriateness Criteria™

Clinical Condition: Blunt Abdominal or Pelvic Trauma, Suspected Vascular Injury

Radiologic Exam Procedure	Appropriateness Rating	Comments
Abdominal/pelvic plain radiographs	8	
Computed Tomography with Contrast	8	
Aortography	8	
Selective visceral angiography	7	After screening with contrast enhanced computed tomography or ultrasound or massive pelvic fracture.
Abdominal ultrasound	5	Recommended for use only as a short, focused exam for free abdominal fluid by an experienced operator.
Computed Tomography without Contrast	3	

Intravenous pyelogram	3	
Magnetic resonance imaging	3	No current role in the acute trauma patient evaluation.
Radionuclide renal scan	1	Not indicated in initial screening; occasionally used in follow-up to assess residual renal function.
Abdominal Doppler ultrasound	1	No role in the acute trauma patient evaluation.
Aortoiliac ultrasound	1	No role in the acute trauma patient evaluation.
Aortoiliac Doppler ultrasound	1	No role in the acute trauma patient evaluation.
Intravascular ultrasound	1	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Excerpted by the National Guideline Clearinghouse (NGC)

Abdominal-Pelvic Plain Radiographs

Abdominal and pelvic plain films have been available for many decades. In the past, they were a mainstay of radiologic diagnosis. Today, they are key elements in the early diagnosis of bony injury, which can be an important clue to the presence of significant soft tissue and visceral trauma. Also, findings related to the soft tissues, such as free air in the abdomen and expanding masses, can provide early critical data in acutely traumatized patients. Frequently, however, when there is suspicion of significant trauma, plain films act only to help direct further evaluation and therapy.

Computed Tomography With Contrast

There is an abundance of literature indicating that computed tomography is sensitive, specific, and accurate in the diagnosis of blunt abdominal trauma. In almost all circumstances, computed tomography examination of the abdomen and pelvis with intravenous contrast is recommended. There are, of course, certain exceptions such as patients with severe reaction to intravenous contrast and

those who have significant impairment of renal function. Decisions about contrast use in this as well as all other circumstances should be left to the judgment of the radiologist. Many radiologists advocate use of oral contrast as well. Some authors have suggested that there is incremental value to evaluating the upper abdomen both before and after intravenous contrast. Others question whether this is valuable in terms of time and cost.

The pediatric population presents certain unique features in the setting of trauma. For example, authors have described a relatively specific set of findings in children who are hemodynamically unstable, and manifest organ hyperfusion. A significant correlation between the presence and amount of peritoneal fluid and the need for laparotomy has also been found in children post trauma.

In both children and adults, authors document quite convincingly that active hemorrhage can at times be diagnosed through computed tomography scans.

In the past, there has been significant debate, particularly between surgeons and radiologists, on the relative efficacy of peritoneal lavage versus computed tomography. It would be fair to say that peritoneal lavage is a sensitive indicator of intra-abdominal hemorrhage post trauma. It does not, however, provide any of the specific data about visceral and vascular injury, which have become important in the successful and efficacious management of trauma patients. Thus, it becomes very much a question of what data are needed to effectively deal with trauma patients. Particularly, when talking about suspected vascular injuries, the precise location and nature of the suspected injury may be critical. This type of data cannot be derived from peritoneal lavage.

There is a large, ever-increasing literature on the utility of computed tomography in evaluating specific visceral injuries. This ties in closely with the suspicion of vascular injuries, since in most cases, breach of the vascular system by trauma is a key element in morbidity and mortality.

For specific organ injury, evaluation of splenic trauma through computed tomography has been highly successful. Computed tomography is also quite helpful in follow-up of patients with splenic trauma or those who develop delayed symptoms in which splenic injury is suspected.

Hepatic injuries, although less common than splenic lesions, can be catastrophic, particularly when they involve the hepatic venous system. Computed tomography plays an instrumental role in guiding physicians in conservative treatment with bed rest versus the need for more aggressive angiointerventional or surgical therapy.

In the pre computed tomography-ultrasound era, renal trauma was more amenable to diagnosis than splenic or hepatic trauma. Even here, computed tomography has added a new dimension to the evaluation of the renal parenchyma and pedicle. Studies have shown computed tomography to be significantly more sensitive than intravenous pyelography in diagnosis of renal trauma. Computed tomography also plays a significant role in the evaluation of main or segmental renal artery occlusion.

For evaluation of specific abdominal vessels, there is an increasing literature indicating that computed tomography, while not as sensitive or specific as angiography, could provide important clues. A constellation of findings has been reported that should suggest the possibility of inferior vena caval injury. Signs that point toward aortic trauma have also been reported. Others have described findings that may suggest inferior mesenteric artery injury. It is, however, readily conceded that angiography is the gold standard for evaluation of the abdominal and pelvic vascular beds.

Pelvic injuries are just as amenable to diagnosis through computed tomography as those in the abdomen. In the pelvis, computed tomography plays two added roles. It has a far greater sensitivity in detection of pelvic fractures than does plain films and it is an important modality for the evaluation and follow-up of pelvic hematoma, which can be life threatening.

Aortography and Selective Visceral Angiography

Although these are assessed separately in the appropriateness criteria table, they go hand in hand in most instances. Angiography is considered the end point for evaluation of underlying vascular injuries. With the development of interventional angiographic techniques, catheterization should not be considered merely a diagnostic procedure but a therapeutic one as well.

Several authors report on the successful use of embolization and drainage techniques in patients with hepatic vascular lesions post trauma. In those settings, follow-up computed tomography is quite valuable in assessing and ensuring healing.

Angiography is sensitive and specific in the evaluation of major arterial injuries. One series of 280 arteriograms reported sensitivity in detecting major arterial injuries of 98.3%, a specificity of 98.5%, a positive predictive value of 95%, and a negative predictive value of 99.5%.

The use of interventional radiology in trauma is relatively new. Some practitioners believe that interventional radiology is under-used because in many centers, emergency room physicians and trauma surgeons are unfamiliar with the modality. Radiologists should emphasize the utility of interventional radiology in the face of trauma and its potential impact on morbidity and mortality, as well as its limitations.

Injuries to the pelvic vasculature, particularly those associated with posterior pelvic ring fractures, are a continuing source of significant morbidity and mortality in the trauma population. In these patients, careful monitoring and early consideration of transcatheter embolization can be critical. The efficacy of embolization in controlling pelvic hemorrhage in both the preoperative and postoperative periods has been demonstrated. Some authors have incorporated diagnostic and therapeutic angiography into the algorithm they use in evaluating patients with hemorrhage secondary to major pelvic fractures.

Computed Tomography Without Contrast

Although some authors suggest that noncontrast computed tomography of the abdomen, followed by contrast computed tomography of the abdomen, may provide additional data in trauma patients, there is no body of literature that advocates solely the use of computed tomography without contrast in the evaluation of abdominal and pelvic trauma. This is particularly the case when vascular injuries are suspected. However, there certainly are circumstances in which the decision not to use contrast may be made on excellent clinical grounds in a particular patient.

Intravenous Pyelogram

Although intravenous pyelography was the mainstay for evaluation of the urinary tract before the advent of computed tomography, it now plays a very secondary role. Since the main "risk" associated with any of these procedures involves the use of iodinated intravenous contrast, the same risk is present in intravenous pyelography as in computed tomography. Because computed tomography is more sensitive in detection of post traumatic renal lesions, there is little to recommend intravenous pyelograms in the usual trauma situation. However, as with any diagnostic examination, there may be circumstances, such as when a patient's clinical status dictates immediate surgery and there is a need to ensure a functional urinary tract, in which this procedure proves helpful.

Radionuclide Renal Scan

This is rarely used in the face of abdominal and pelvic trauma. If renal vascular injury is suspected, angiography provides more specific anatomic information.

Abdominal Ultrasound

The increased utilization of abdominal ultrasound in the initial evaluation of the trauma patient is probably the most controversial development in the recent trauma literature. Although the thoroughness of the ultrasound exam varies, in its essence, the goal of the exam is to identify the presence of free intraperitoneal fluid. The two salient features of the largest and better performed trials are 1) the ultrasound examination was performed by ultrasound technologists; and 2) the examination adhered to a strict protocol designed for speed, resulting in exams performed in 2-5 minutes.

One of the potential applications of ultrasound evaluation for trauma is to triage patients before an abdominal computed tomography scan. Some trials have shown a decrease in the need for peritoneal lavage and abdominal computed tomography with the proper use of trauma ultrasound. Most trials follow a positive ultrasound examination for free intraperitoneal fluid with a computed tomography, if the patient is hemodynamically stable. Unstable patients with a positive ultrasound go for emergency laparotomy. Almost all centers currently using ultrasound for trauma make no attempt to evaluate the abdominal solid organs for the site of injury, because the main goal is always keeping the ultrasound exam short and easy to perform. The role of ultrasound in the initial care of the trauma patient is evolving and remains the subject of many large trials. Although ultrasound is very sensitive in detecting free intraperitoneal fluid, it is less reliable in detecting parenchymal injury. Concerns about the operator-dependent quality

of studies need to be addressed by standardized, simple protocols, such as the ones cited in the above references.

Abdominal Doppler Ultrasound

This has not been used extensively in the face of trauma. One could conceive of a use in screening for certain vascular injuries. However, the degree of cooperation and the clinical status of the patient would make this quite difficult to carry out. The combination of computed tomography and angiography provide more reliable data.

Aortoiliac Ultrasound

A role for this procedure in acute trauma has not been defined.

Aortoiliac Doppler Ultrasound

A role for this technique in patients with blunt abdominal pelvic trauma in which vascular injury is suspected has not been defined.

Magnetic Resonance Imaging

To date, computed tomography is the cross sectional imaging method of choice in the face of trauma.

Intravascular Ultrasound

This has not been reported to be a clinically useful tool that provides unique data in traumatized patients.

CLINICAL ALGORITHM(S)

Algorithms were not developed from criteria guidelines.

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The recommendations are based on analysis of the current literature and expert panel consensus.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate selection of initial radiologic exam procedures to aid in differential diagnosis of blunt abdominal or pelvic trauma, with suspected vascular injury

POTENTIAL HARMS

None identified.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

An American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those exams generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Pagan-Marin H, Bettmann MA, Boxt LM, Gomes AS, Grollman J, Henkin RE, Higgins CB, Kelley MJ, Needleman L, Polak JF, Stanford W, Hessel SJ. Blunt abdominal or pelvic trauma--suspected vascular injury. American College of

Radiology. ACR Appropriateness Criteria. Radiology 2000 Jun;215(Suppl):41-7. [67 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

1995 (revised 1999)

GUIDELINE DEVELOPER(S)

American College of Radiology - Medical Specialty Society

SOURCE(S) OF FUNDING

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria™

GUIDELINE COMMITTEE

ACR Appropriateness Criteria™ Committee, Expert Panel on Cardiovascular Imaging.

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Names of Panel Members: Heriberto Pagan-Marin, MD; Michael A. Bettmann, MD; Lawrence M. Boxt, MD; Antoinette S. Gomes, MD; Julius Grollman, MD; Robert E. Henkin, MD; Charles B. Higgins, MD; Michael J. Kelley, MD; Laurence Needleman, MD; Joseph F. Polak, MD, MPH; William Stanford, MD; Samuel J. Hessel, MD

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline. It is a revision of a previously issued version (Appropriateness criteria for blunt abdominal or pelvic trauma-suspected vascular injury. Reston [VA]: American College of Radiology [ACR]; 1995. 7 p. [ACR Appropriateness Criteria™]).

The ACR Appropriateness Criteria™ are reviewed after five years, if not sooner, depending upon introduction of new and highly significant scientific evidence. The next review date for this topic is 2004.

GUIDELINE AVAILABILITY

Electronic copies: Available (in PDF format) from the American College of Radiology (ACR) Web site.

Print copies: Available from ACR, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI on February 20, 2001. The information was verified by the guideline developer on March 14, 2001.

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